

What is claimed is:

1. A fiber reinforced composite material comprising: a fiber reinforced polymer substrate; a first polymeric layer coating the fiber reinforced polymer substrate for joining two different polymeric composites, the first polymeric layer being free of fibers and particulate; a second polymeric layer coating the first polymeric layer, the second polymeric layer comprising a polymeric matrix and a particulate within the polymeric matrix; and at least one thermally sprayed material coating the second polymeric layer to form an adherent multi-layer coating attached to the fiber reinforced polymer substrate.

2. The fiber reinforced composite of claim 1 wherein the first polymeric layer is a material selected from the group consisting of epoxy and thermosetting resins.

3. The fiber reinforced composite of claim 1 wherein the first polymeric layer is a two component epoxy resin of bisphenol F/epichlorohydrin + diethylenetriamine.

4. The fiber reinforced composite of claim 1 wherein the particulate in the second polymeric layer is at least one material selected from the group consisting of metals, ceramics, and cermets.

5. The fiber reinforced composite of claim 1 wherein the particulate is a material selected from at

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least one of the following groups: Group I, aluminum, nickel, iron, chromium, and cobalt; Group II, aluminum-base, nickel-base, iron-base, chromium-base, and cobalt-base alloys; Group III, aluminum, chromium, zirconium and silicon oxides; Group IV, aluminum, chromium, zirconium and silicon compounds; Group V, chromium, tungsten, boron, silicon carbides; and Group VI, boron and chromium nitrides.

6. The fiber reinforced composite of claim 1 wherein the second polymeric layer contains about 20 to 85 weight percent particulate.

7. The fiber reinforced composite of claim 1 wherein the second polymeric layer contains about 60 to 80 weight percent particulate.

8. The fiber reinforced composite of claim 1 wherein the adherent multi-layer coating attaches to the fiber reinforced polymer substrate with a tensile strength of at least about 10 MPa.

9. The fiber reinforced composite of claim 1 wherein the size of the particulate material in the second layer is less than about 500 μm .

10. The fiber reinforced composite of claim 1 wherein the first polymeric layer has a thickness of about 0.002 to 0.127 mm and the second polymeric layer has a thickness of about 0.050 to 3.2 mm.

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11. A fiber reinforced composite material comprising: a fiber reinforced polymer substrate; a first epoxy layer coating the fiber reinforced polymer substrate for joining two different polymeric composites, the first epoxy layer being free of fibers and particulate; a second epoxy layer coating the first epoxy layer, the second epoxy layer comprising an epoxy matrix and a particulate within the epoxy matrix; and at least one thermally sprayed material coating the second epoxy layer to form an adherent multi-layer coating attached to the fiber reinforced polymer substrate, the multi-layer coating being attached to the fiber reinforced polymer with a tensile strength of at least about 10 MPa.

12. The fiber reinforced composite of claim 11 wherein the first epoxy layer has a thickness of about 0.005 to 0.076 mm and the second epoxy layer has a thickness of about 0.5 to 1.27 mm.

13. The fiber reinforced composite of claim 12 wherein the first and second epoxy material is a bisphenol F/epichlorohydrin + diethylenetriamine, the particulate material in the second epoxy layer is aluminum or nickel, and the thermally sprayed material is chromium oxide or nickel/chromium oxide with the chromium oxide coating the nickel.

14. The fiber reinforced composite of claim 13 wherein the fiber reinforced polymer substrate contains carbon fibers.

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15. The fiber reinforced composite of claim 14 wherein the fiber reinforced polymer substrate ~~is a~~ cylindrical roll having an outside cylindrical surface and the multi-layer coating covers the outside diameter surface of the cylindrical roll.

16. The fiber reinforced composite of claim 15 wherein the cylindrical roll consists of an article of manufacture selected from the group consisting of fluid metering rolls, rolls used in the production of paper and rolls used in film processing.

17. A process of applying a coating on a fiber reinforced composite material comprising the steps of:

a) applying a first polymeric layer to a fiber reinforced polymer substrate, the first polymeric layer being free of fibers and particulate;

b) applying a second polymeric layer coating to the first polymeric layer to join the fiber reinforced polymer substrate to the second polymeric layer using the first polymeric layer as a bonding agent, the second polymeric layer comprising a polymeric matrix and a particulate within the polymeric matrix; and

c) thermal spraying a material to coat the second polymeric layer with the first and second polymeric layers protecting the fiber reinforced polymer substrate.

18. The process of claim 17 including the additional steps of roughening ~~the~~ surface of the fiber reinforced composite substrate before applying the first polymeric layer; and roughening the surface of

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the second polymeric layer before thermal spraying the material on to the second polymeric layer.

19. The process of claim ~~17~~ wherein the fiber reinforced polymer substrate is a cylindrical roll having an outside diameter surface and the applying the first polymeric layer consists of coating the outside cylindrical surface of the cylindrical roll.

20. The process of claim ~~17~~ wherein the first and second polymeric layers are a bisphenol F/epichlorohydrin + diethylenetriamine, the particulate material in the second polymeric layer is aluminum or nickel, and the thermally sprayed material is a single layer of chromium oxide or a multi-layer consisting of an inner nickel layer and an outer chromium oxide layer.

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